

AMENDMENTS TO THE SPECIFICATION

Please amend the specification, as follows:

Replace paragraph [0001] with the following amended paragraph [0001]:

This ~~U.S. nonprovisional patent~~ application claims priority ~~under 35 U.S.C. § 119 of~~ from Korean Patent Application No. 10-2003-0026069, filed on April 24, 2003, in the Korean Intellectual Property Office (KIPO), the entire contents of which are hereby incorporated herein by reference.

Replace paragraph [0003] with the following amended paragraph [0003]:

Generally, Moving Picture Experts Group (MPEG) digital video play apparatuses receive a digital video stream from digital storage media (DSM)₁ such as ~~as~~ digital versatile discs (DVDs), digital video cassette recorders (DVCRs)₁ and hard disk ~~drivers~~ drives (HDDs)₁ in order to play the digital video stream or perform various trick-play functions. Trick-play functions may include a fast forward, a slow forward, a fast reverse₁ and a slow reverse.

Replace paragraph [0029] with the following amended paragraph [0029]:

The input digital video stream may be serially inputted to the video player 14 according to a given transmission procedure. If the reverse play function key is activated, the video player 14 serially provides the reverse image output to the display unit 16. In this case, the video

player 14 may ~~encode~~ decode the currently inputted group of pictures GOP2 during a reverse play, and decode the previously inputted group of pictures GOP1 at the same time.

Replace paragraph [0030] with the following amended paragraph [0030]:

For a reverse play operation, the inputted I-pictures and B-pictures may be stored in a frame memory. The P-pictures may be converted to I-pictures using a bit rate of the I-pictures. Since the P-pictures in the group of pictures are composed of similar scenes to the I-picture at the head of the identical group of pictures, the pictures in an identical picture group have similar complexity[[,]] (because there is probably not much shift in scenes within the group of pictures). Therefore, a targeted bit rate of pictures inputted to an I-frame ~~decoder~~ encoder may be set with respect to the information of the I-picture at the head of the group of pictures during a reverse play. Then, the P-pictures may be converted into I-pictures using the set bit rate and may be stored in a buffer memory. The stored I-pictures may be read from the buffer memory according to a procedure of display and are decoded in a video decoder.

Replace paragraph [0033] with the following amended paragraph [0033]:

The picture sorter 110 may sort I-pictures, B-pictures, and P-pictures from the input video stream and output the pictures. That is, the picture sorter 110 may output the sorted I-pictures to an I-picture memory 160 and an I-frame encoder 140, the B-pictures to a B-picture memory 150, and the P-pictures to the video ~~encoder~~ decoder 120, according to an exemplary embodiment of the present invention.

Replace paragraph [0036] with the following amended paragraph [0036]:

The I-frame encoder 140, according to an exemplary embodiment of the present invention, may include a bit rate determining unit 142 and an I-frame encoding unit 144, as illustrated in FIG. 4. The bit rate determining unit 142 may receive the decoded P-pictures from the ~~video decoder~~ frame memory 130 to set a bit rate corresponding to the size information of the I-pictures. The I-frame encoding unit 144 may convert the decoded P-pictures into I-pictures using the determined bit rate and may output[[s]] the converted I-pictures to the I-picture memory 160.

Replace paragraph [0039] with the following amended paragraph [0039]:

When the decoded P-pictures are read from the frame memory 130 and are ~~decoded~~ converted into I-pictures, a targeted bit rate may be determined using size information of an I-picture at the head of the ~~subgroup~~ of the GOP. In this case, the targeted bit rate may be set with respect to a residual ~~capacitance~~ capacity by discriminating a state of I-picture memory 160, which may be expressed by the following exemplary Equation 1.

<Equation 1>

Targeted bit rate (I2) = Size (I1) ± a

Replace paragraph [0040] with the following amended paragraph [0040]:

In the above equation, the targeted bit rate I2 is a targeted bit rate used in a bit rate determining unit 142, while ~~encoding~~ converting the P-picture of the next group of pictures in an identical group of pictures to an I-picture. The size I1 may indicate a bit rate of the I-picture at the head of the group of pictures. The “a” may represent a state of the buffer where the I-picture is stored. The “a” may add or subtract a proper size to the targeted bit rate according to a remaining capacity of the buffer. If the size I1 is 80 kilobits per second (kbps), for instance, the targeted bit rate I2 is 80 kbps. However, the targeted bit rate I2 can be set in a range of 30 kbps to 120 kbps, corresponding to a state of the buffer.

Replace paragraph [0042] with the following amended paragraph [0042]:

As described above, in an exemplary embodiment of the present invention, the targeted bit rates of the input pictures received by the I-frame encoder 140 are set with reference to the size of the I-picture at the head of a group of pictures, because the pictures in the group may have similar complexity and/or a smaller shift. That is, the procedure of ~~re-encoding~~ converting a P-picture to an I-picture may be performed within a frame having similar pictures, such that a targeted bit rate can be effectively achieved by means of the already existing I-picture at the head of the group of pictures encoded in the frame, and without added processing or calculations.

Replace paragraph [0044] with the following amended paragraph [0044]:

Referring to FIG. 5, in an exemplary embodiment of the present invention, the video play apparatus 100 may receive the encoded digital video stream as a group of pictures (GOP) from the digital video data storage media, and sort out I-pictures, P-pictures and B-pictures (for example, by the picture sorter 110) in step S200. In step S210, the I-pictures of the sorted pictures from step S200 ~~[[S210]]~~ may be output to the I-frame encoder 140 and the I-picture memory 160. The P-pictures may be provided to the I-frame encoder 140 through the video decoder 120 and the frame memory 130, and the B-pictures may be stored in the B-picture memory 150. The bit rate determining unit 142, in the I-frame encoder 140, may determine the size information of the I-picture at the head of the first subgroup of pictures and control the bit rates of the P-pictures of the next subgroup of pictures using the size information in step S220. That is, the bit rate determining unit 142 may determine the size information (SIZE) from the I-picture of the first subgroup of pictures, and set the bit rates of the P-pictures in response to the determined bit rate while the P-pictures of the subgroup of pictures are ~~encoded~~ converted into I-pictures.

Replace paragraph [0045] with the following amended paragraph [0045]:

Referring to FIG. 5, in an exemplary embodiment of the present invention, step S230 may ~~encode~~ convert the P-pictures into I-pictures using the set bit rates, and store the ~~encoded~~ converted I-pictures in the I-picture memory 160. In ~~[[the]]~~ step ~~[[of]]~~ S240, the I-pictures (and the I-pictures ~~encoded~~ converted from the P-pictures) stored in the I-picture memory 160~~[[,]]~~ and

the B-pictures stored in the B-picture memory 150[[,]] are provided to the video ~~encoder~~
decoder 120 in a reverse display order using pointing information (POINT) from a buffer
linker 170. The pictures may then be decoded, and the reverse video image data may then be
output according to the reverse display procedure.